The ANITA BONDING CONSOLE OTHE04

Engineered for Hazardous Environment Applications to Fueled AIRCRAFT

Advanced patch repair with dual heat circuit control & more advanced features

1 PRESENTATION

To comply with safety procedures imposed to use bonding electrical equipment in an area classified as hazardous the ANITA Console Family offers a version fully compliant under the P/N: GMIOTHE04. This version is the adaptation to the standard hazardous environment of the famous version standard for workshop use GMIOT9701.

The complete cabinet is pressurised permanently and the electrical power is controlled according to certain logic to prevent any cause for developing electrical arcs.

The very unique design leaves the equipment as simple as it is in its standard workshop version. Its programming and run principles remain unchanged.

In a compact size, the ANITA OTHE04 offers all the features to control with an advanced software **a bonding patch** of small or very large size. It allies small pack to a simplicity of use that made it a **standard** among manufacturers or repair stations.

⇒ 12 Thermocouple scan capacity,

⇒ Test of heating blanket, detection of connection and of blanket break,

⇒ Two zone control for a balanced heat distribution,

⇒ Intuitive programming,

⇒ Safety system to comply for use in explosive area.

By its size and its extreme simplicity of use the ANITAOTHE is the companion of the repair technician to run to the field and to work on the aircraft.

2 HAZARDOUS SAFETY FEATURES

The Anita OTHE04 complies with the safety conditions required by the european standard CENELEC EN 50016.

This safety design deals with all relevant levels of the equipment and of its accessories directly connected:

1. **Initial air purge and positive pressurisation**
   Objective: protection of the cabinet against danger of explosion due to explosive air that may enter the console.
   The protection is obtained by continuous air purge and internal pressurization of the complete enclosure compartments. The whole system is permanently air sweeped with a slight positive pressure to ensure that no explosive air invades the internal volume where a possible arc incident may be caused by electrical circuits.

2. **Control of On/Off Power**
   A timer safety allows powering of the console only after a certain duration of air purge enough to guarantee that no more dangerous air is present in the cabinet. The volume of the console is renewed 5 times before authorization is given to operate.
   In case of power break during a cycle a procedure of cycle resume is elaborated.
3. **Protection of fire and explosion due to arcs on electrical heating resistance.**
   All connections either to the console, between cables and with heating blankets are made through connectors with a specific design. This design allows to disconnect under power without arcing.
   The plugs have a pilot contact.When disconnection is performed, the power to the element is turned off before complete disconnection, avoiding the development of an electric arc.
4. **Leak current detection**
   A ground safety circuit is included inside the console. In case of a defective blanket, the power to the blankets is cut preventing a fire may accidentally develop
   (see also grounding of blankets in next paragraph).
5. **Heating blanket safety design**
   Heating blankets must comply with the regulation. They are manufactured specifically with ground screen embedded. In case of the silicone blanket envelope is damaged, any resulting current leak to the ground will be detected by a safety circuit inside the console and the power to the blanket will be turned off.
6. **Emergency switch off**
   The console is also equipped with an emergency switch that cuts instantaneously all power to blankets

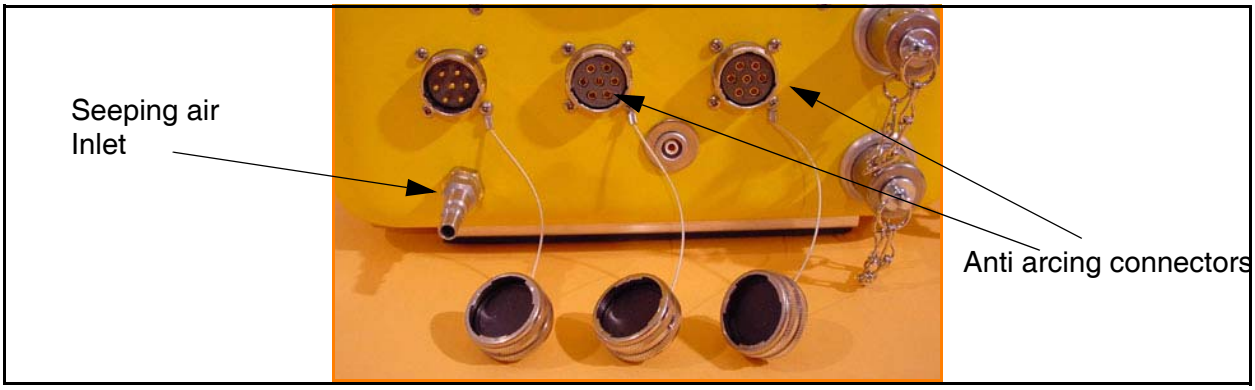

Figure 1: Connections are in front of console; note the small size of electrical anti - arcing connectors

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Figure 2: Emergency switch in red

Figure 3: Anti arcing connector as mounted on heating blankets and cables; see also the tab of blanket that indicates a ground lead (green) moulded inside the blanket

3 BONDING PROCESS CONTROL - MAIN FEATURES

The Anita OTHE, built for an explosive environment operation, is the smallest compact bonder on the market.It is the only equipment of this category to offer for **one patch bonding** the capability of **dual heating channels** to maintain a balance of temperature on the whole area.

The ANITA is conceived for push button operations for an automatic cycle where all aspects of curing process are handled by an advanced software that benefited from twenty years of experience of GMI in the field of composite repair.

The OT has been conceived to offer all the necessary functions to perform a bonding repair on an advanced carbon structure.

⇒ **A large temperature scanning capacity**
The ANITA OT offers the capacity of temperature scanning through up to **12 thermocouples.** This feature is appropriate for a large repair with complex structures where it is necessary to detect differences of temperature.

⇒ **A dual heating channel control**
The dual heat control allows, as explained below, to balance the heat control according to the thermal reactions of the structure areas covered by the patch. A patch may cover a thin and a thick structure areas. A two zone blanket will thus be controlled so that energy is sent to each area appropriately according to the structure thermal reaction.

⇒ **An extreme simplicity of programming**
Since its introduction on the market, the principle of programming design has been the favourite feature of shop technicians. The programming needs only to key 2 values: plateau temperature and duration. The software controls all other parameters.

⇒ A push button operation
After the cycle is selected or programmed, the run starts after just a switch down operation. All tests are handled by the software and automatic decisions are taken so that the cycle is conducted in continuity without halt or hold for defects that the operator cannot interpret.

Figure 4: Left: the Anita OTHE closed showing external connectors of high quality. When opened (right) the Anita appears straightforward to be used; no complicated keyboard; a software has been designed so that the ANITA answers automatically to switch selections.

4 MAIN ADVANTAGES ILLUSTRATED

4-1 Patch Repair with Appropriate Temperature Control

To day, it is no more possible to deal with patch temperature control as twenty years ago. A true bonding console must have this minimum feature to deal with modern advanced carbon structures.

It is possible to connect one heating blanket to cover the patch and cure its resin. However the ANITA OT has an extra asset to deal with the usual difficulty met when dealing with an aircraft part, the various thicknesses of structures that induce different behaviours in terms of heat transfer.
It is possible to connect One blanket with **Two Heating circuit independent** for compensation of difference of heat behaviour in two areas of the structure. Each circuit is energized independently.

A patch being small (30 cm diameter) or large (60, 80 cm diameter), the ANITA can face the job... because the ANITA offers a switching capacity of 30 Amperes.

4-2 Temperature Control

4-2.1 Innovative temperature control for automatic profiling

The temperature of the part heated by the heating blanket is under control of a software that manages the set range of thermocouples.
As the raise of temperature is the result of a conduction process by a heating mat, the temperatures on various points of the structure may be different because of variable losses of heat according to the area and measurement locations. To face this control dilemma, a special treatment of all the measures is made automatically by the software and the orders to the heating blanket are derived.

Amalgation of all data is thus used to improve the conduct of heat transfer on the whole surface so that an optimum temperature profile is found no temperature above the tolerated limit and avoid of cold areas.

4-3 Dual Heat Control

4-3.1 Dual Circuit Blankets

When a bonding is made on a structure having obviously a variation of thickness, the use of the second heating channel becomes a necessity.

GMI offers supply of two different circuit mats so that the heat control can be differentiated on the two areas.

Figure 5: Here a blanket with two circuits to control differently two adjacent areas: one being a uniform laminate, the other with stringer constituting a heat sink.

4-3.2 Two Blanket Control

In other cases of repair, laying two separate blankets side by side allow to get similar results as a unique

4-3.3 Two patch repairs

Thanks to the dual channel installation with independent temperature control it is also possible to bond Two Patches simultaneously with the same profile.

4-3.4 Large area control

The control of temperature in large area is also greatly facilitated with the ANITA dual control feature.
Say, the repair patch has a diameter of 600 mm, a two circuit blankets is used. One circuit for the internal area control (40 cm diameter), a second circuit for the periphery. This will allow the control of the centre of the area at the rated temperature, while the second peripheral circuit will be also maintained at the same temperature.

Other cases find easily a solution thanks to this feature. For example, when heating a long vertical surface. The two circuit blanket will avoid to overheat the upper area.

4-3.5 The two skin bonding in a single operation

When a sandwich is perforated on both skins, it is thus possible to combine the dual channels to implement the bonding of the two skins simultaneously with a differentiated control.

The dual channel is also a great feature when curing a radome repair where it is a command to be able to differentiate top and side areas under a single tip blanket.

5 THE GENERAL SPECIFICATIONS

5-1 Mechanics, Voltage, Power and Heating Capacity

⇒ Dimensions: 308 x 206 x 206 mm

⇒ Weight:...09 Kg

⇒ Colour of console: yellow

⇒ Volts: 220 or 120 VAC, **automatic switching (of course blankets must be designed accordingly)**

⇒ Power Capability: 30 Amps x 220 Volts = 6000 Watts or 30 x 120 Volts = 3600 Watts

⇒ **Two Circuit Control: One** Heating Zone + a **SECOND** one for temperature balance

5-2 Anti Hazardous safety features

⇒ Leak current test circuit,

⇒ Permanent venting of the console (needs supply by the user of clean compressed air supply between 3 and 6 bars - 45 and 90 psi)

⇒ Test of positive pressure inside the enclosure,

⇒ Timer for power on only after initial purge of air of the enclosure,

⇒ All connectors as anti-arcing connectors and automatic power off of circuits under power,

⇒ Heating blankets with ground screen for leak detection

⇒ Protection cover for no access to external fuses.

⇒ All blanket cables come with special circular **anti arcing** connectors mounted for a high quality coupling Our blankets come also with same quality mating connectors.

5-3 General: temperature, vacuum, display,....

⇒ Thermocouple scanning capacity: type J, **12 plugs**

⇒ Vacuum: Venturi pump installed with **high** performances: -0.87 bar(27 in Hg) - **High Flow for efficient leak compensation**

⇒ Vacuum panel gauge for vacuum venturi pump test

⇒ Vacuum electronic gauge on return hose from bag to qualify the actual vacuum in bag itself.This value is monitored permanently, displayed, printed, recorded.

⇒ Printer with large standard paper

⇒ Programming by an innovative dialogue in two immediate steps. Ramp, Plateau and Duration values are just keyed. The use is straightforward.

⇒ Programs can be saved in memory. Two libraries possible. One (max capacity 19 programs) is delivered with all usual resin programs already installed. A second one can be constituted by the user.The max. capacity for the user being: 19 programs

⇒ Panel display of Temperature and Vacuum Instantaneous Values; clear and large digits visible from far; permanent scanning of all measures of temperature and vacuum

⇒ Visual and audible alarms,

⇒ Panel mimics visible from far: lamp for identification of heat on/off, alarms for temperature and vacuum,.end of cycle.

⇒ Internal clock and calendar for repair identification

⇒ Easy accessible external fuses

⇒ Test of presence of blanket; measurement of power of blanket

⇒ Innovative **PC Software ANITALK** delivered for:

→ Feature configuration, Library Cycles programming,

→ Real Time Supervision Training, Quality control data Files

→ Graphic analysis,

→ Circuit calibration.

6 DELIVERY

6-1 General

The ANITA Console comes with all its accessories necessary to implement a bonding operation under vacuum: a complete set of cables, hoses, in a nice storage and transportation console.
Console Dim: 18 x 14 x 7 in (460 x 350-x 166 mm); Weight: 22 Lb. -10 Kg

Colour: yellow

6-2 Content List:

⇒ A Power cable: 1 unit 1of length 5 m (6-ft.)

⇒ Blanket cable: 2 units of length 3 m (10ft)

⇒ Vacuum Silicone Hoses: 2 units, one for vacuum, one for return sensing of length 3 m (10-ft.)

⇒ Vacuum sniffers ,

⇒ Thermocouple cables:12 of 3 m long (6 ft.)

⇒ A first set of printer consumable,

⇒ A PC communication cable (RS232 mode),

⇒ A PC software ANITALK for PC programming, supervision on line, quality control, storage of data

⇒ A User and Service Manual.

Figure 6: The accessory case very convenient to group all necessary items

7 REFERENCES TO ORDER

P/N:GMIOTHE04-1 Dialogue in English; units in °C and Bars
P/N:GMIOTHE04-2 Dialogue in French; units in °C and Bar
P/N:GMIOTHE04-3 Dialogue in English; units in °F and In Hg

8 CONSUMABLES

⇒ A box of 20 printer paper rolls P/N: GMINGI010-01
⇒ A box of 10 printer ink cartridges P/N: GMINGI010-02

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